

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology.

CHARACTERISTICS OF THE WEATHER FOR MAY.

May, 1901, was in some respects like the preceding month. The few areas of low pressure which appeared within the field of observation moved slowly, and in one or two cases followed an erratic course. It was also like the preceding month, in that monthly mean pressure was decidedly low in the South Atlantic States and relatively high in the Lake region. In consequence of this distribution of pressure heavy rains fell east of the Appalachians and also in the Southwest, particularly in Oklahoma, northern Texas, and northeastern New Mexico. In the Mississippi, Missouri, and lower Ohio valleys, and the Lake region the rainfall was below the seasonal average. Temperature, on the other hand, was markedly above the normal from the upper Lake region west and southwest to the middle Rocky Mountain districts, and northward to the Canadian boundary. As in the previous month, the number of thunderstorms and violent local winds was remarkably small.

The most striking characteristic of the month was the diminution in monthly mean pressure over the South Atlantic States.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV and the numerical values are given in Tables I and VI.

As stated in the preceding paragraph, pressure was relatively high over the upper Lake region and on the Pacific coast. It was relatively low over the South Atlantic States and in the Plateau region of the west. As compared with the preceding month there was a marked fall in all regions, especially in the St. Lawrence Valley and the Lake districts. Pressure was below the normal everywhere, except on the north Pacific coast and eastern Manitoba, including the Valley of the Red River of the North.

Pressure has been below the normal in the South Atlantic States continuously since and including January of the current year. The tendency of the areas of low pressure to skirt the South Atlantic coast States was especially pronounced in the preceding as well as the current month. In the latter month, moreover, there was an absence of areas of high pressure which, in a normal month, move southeasterly from the upper Mississippi Valley and merge with the permanent area of high pressure over the middle Atlantic.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

Temperature continued about normal or below the seasonal average in the South Atlantic States; also in southern New England, the Ohio Valley, and in portions of the Southwest. The greatest positive departures were recorded mainly in the Rocky Mountain districts north of the thirty-fifth parallel

and in the upper Missouri and upper Mississippi valleys. Over this great region temperature was almost continuously above the seasonal average. It is worthy of mention that temperature has been unusually high in this region almost continuously since the first of the year. Maximum temperatures of 100° and over were registered in the Rio Grande Valley and elsewhere in western Texas; also in eastern Montana and in the interior valleys of California and Arizona. In portions of the Lake region and in northern New England maximum temperatures as high as 80° were not recorded. Minimum temperatures as low as the freezing point were observed in northern Michigan, northern Minnesota, and quite generally in North Dakota, portions of South Dakota, and throughout the Rocky Mountain region.

The average temperature for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
New England	10	52.4	- 1.5	- 4.8	- 1.0
Middle Atlantic	12	60.3	- 1.3	- 5.3	- 1.1
South Atlantic	10	70.2	0.0	- 11.0	- 2.2
Florida Peninsula	7	75.8	- 0.2	- 12.3	- 2.5
East Gulf	7	72.3	- 0.4	- 10.4	- 2.1
West Gulf	7	72.5	- 0.1	+ 0.4	+ 0.1
Ohio Valley and Tennessee	12	63.9	- 1.3	- 10.0	- 2.0
Lower Lake	8	55.7	- 1.0	- 5.8	- 1.2
Upper Lake	8	52.2	+ 0.8	+ 3.2	+ 0.6
North Dakota	8	60.6	+ 7.2	+ 23.0	+ 4.6
Upper Mississippi Valley	11	62.2	+ 0.8	+ 2.7	+ 0.5
Missouri Valley	10	62.3	+ 2.2	+ 12.7	+ 2.5
Northern Slope	7	59.3	+ 5.9	+ 14.6	+ 2.9
Middle Slope	6	63.7	+ 0.7	+ 1.4	+ 0.3
Southern Slope	6	67.3	- 1.6	- 0.5	- 0.1
Southern Plateau	15	63.4	- 1.4	+ 4.2	+ 0.8
Middle Plateau	9	58.2	+ 2.4	+ 10.7	+ 2.1
Northern Plateau	10	57.7	+ 3.4	+ 10.0	+ 2.0
North Pacific	9	53.1	- 1.3	- 2.5	- 0.5
Middle Pacific	5	56.9	- 1.5	- 0.2	0.0
South Pacific	4	61.0	- 1.4	+ 4.0	+ 0.8

In Canada Prof. R. F. Stupart says:

The temperature was higher than normal by between 6° and 10° in Manitoba and the eastern portions of the Northwest Territories; the positive departure diminishing both westward and eastward, 3° in excess in Alberta, lessening to either just average or 1° below on Vancouver Island. In New Ontario and northern Quebec the positive departure from average was about 4°, which difference lessened southward, until in southern Ontario, near Lake Erie, the mean was just equal to average, as was also the case in southern Nova Scotia. In Manitoba unusually high temperature was maintained throughout the month, but in Ontario an unusually high temperature during the first half was succeeded by a fortnight of temperatures nearly as much below normal as before they had been above.

PRECIPITATION.

Rainfall was greatly above the average in a number of districts and correspondingly deficient in others. The greatest deficiency occurred in the lower Missouri Valley, where negative departures of 3 inches were recorded. There was a large deficiency also in the Ohio Valley, Lake region, upper Mississippi Valley, and throughout the Dakotas. Rainfall was decidedly above the average in Montana and also in New Mexico, northern Texas, and elsewhere west of the one hundred and fifth meridian.

The area of deficient rainfall included practically all of the spring wheat region, as well as much territory to the east-

ward, and was surrounded, singularly enough, by a belt of much higher rainfall, the positive departures being from 2 to 4 inches almost on the periphery of the drought-stricken region.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
New England	10	5.56	152	+1.9	+2.4
Middle Atlantic	12	4.58	124	+0.9	-1.3
South Atlantic	10	6.35	161	+2.4	+0.7
Florida Peninsula	7	3.93	106	+0.2	+1.0
East Gulf	7	5.19	118	+0.8	+1.3
West Gulf	7	2.36	63	-2.1	-7.6
Ohio Valley and Tennessee	13	3.61	95	-0.2	-5.6
Lower Lake	8	2.96	84	-0.5	-1.8
Upper Lake	9	2.85	68	-1.4	-3.7
North Dakota	8	0.42	17	-2.0	-3.4
Upper Mississippi Valley	11	2.10	50	-2.1	-4.8
Missouri Valley	10	1.65	39	-3.6	-4.1
Northern Slope	7	2.71	112	+0.3	+0.3
Middle Slope	6	2.37	66	-1.2	-1.7
Southern Slope	6	4.55	121	+0.8	+2.2
Southern Plateau	15	1.01	168	+0.4	+1.3
Middle Plateau	9	1.28	119	+0.2	+0.2
Northern Plateau	10	1.68	94	-0.1	-1.1
North Pacific	9	3.38	114	+0.4	+1.0
Middle Pacific	5	0.90	56	-0.7	-0.3
South Pacific	4	0.86	239	+0.5	+2.0

In Canada.—Professor Stupart says:

The rainfall was very much in excess of average in southern Alberta and in western Assiniboia. It was also in excess, but to a lesser extent, in Ontario, except in the extreme western and eastern portions where it was either average or a little below. Throughout Quebec departures in either direction were not marked; in the Maritime Provinces there was a slight and general excess, and in southern Manitoba and eastern Assiniboia a fairly marked deficiency. In Ontario most of the rain fell after the 17th. Barkerville, Cariboo, reports: No snow remains on the flats, but 4 feet on the mountain trails, leaving slowly.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 6, 7, 12, 16, 17, 20, 25, 30, 31. Arizona, 2, 13, 14, 17, 22, 25, 26, 31. Arkansas, 5, 6, 10, 11, 12, 16, 20, 21, 24, 30. California, 1, 5, 10, 18, 19, 24, 25, 26, 28. Colorado, 1, 2, 6, 7, 12, 13, 15, 16, 18, 19, 20, 21, 22, 27, 28, 29, 30, 31. Connecticut, 24. Delaware, 25. Florida, 7, 26. Georgia, 5, 6, 10, 12, 18, 19, 20, 25, 28, 30, 31. Idaho, 18, 19, 27. Illinois, 2, 5, 6, 9, 20, 23, 24, 27. Indiana, 5, 9, 10, 23, 24, 25. Indian Territory, 9, 15, 16, 17, 22, 30. Iowa, 4, 5, 22, 24. Kansas, 2, 3, 4, 5, 15, 22, 29. Kentucky, 8, 18, 24. Louisiana, 7, 18, 20, 30, 31. Maryland, 11, 24, 25, 30. Massachusetts, 24. Michigan, 2, 3, 8, 12, 13, 14, 15, 22, 23, 24, 28, 29. Minnesota, 1, 2, 11. Mississippi, 12, 13, 14, 24, 30, 31. Missouri, 4, 5, 6, 15, 19, 20, 21, 23, 29. Montana, 15, 18, 29. Nebraska, 2, 3, 4, 5, 10, 23. Nevada, 1, 2, 7, 11, 13, 23, 24, 27, 28. New Hampshire, 3, 24. New Jersey, 15, 18, 29. New Mexico, 2, 7, 20, 30. New York, 13, 17, 24, 31. North Carolina, 5, 6, 8, 9, 10, 12, 13, 14, 22, 28, 30. North Dakota, 9, 10. Ohio, 2, 3, 6, 7, 8, 9, 10, 12, 19, 20, 21, 24, 30. Oklahoma, 9, 13, 15. Oregon, 11, 14, 15, 17, 18, 19, 24, 25, 27, 28. Pennsylvania, 2, 3, 10, 11, 17, 18, 24, 31. South Carolina, 6, 7, 18, 19, 26. South Dakota, 3, 4, 9, 15. Tennessee, 6, 9, 11, 12, 18, 24, 27, 28, 30. Texas, 1, 2, 4, 9, 10, 12, 14, 15, 16, 17, 19, 23, 24, 29, 30, 31. Utah, 2, 7, 21, 24, 26, 28, 29, 30. Virginia, 9, 10, 17, 24, 25, 28, 29. Washington, 7, 17, 18, 19, 21, 28. West Virginia, 7, 8, 9, 10, 18, 22, 24, 25, 28, 31. Wisconsin, 2, 12, 16, 23. Wyoming, 2, 3, 4, 5, 12, 14, 15, 21, 27, 28, 30.

SLEET.

The following are the dates on which sleet fell in the respective States:

California, 1, 2, 3, 18, 24, 25, 26. Colorado, 2, 3, 30, 31. Minnesota, 11. Montana, 9, 17, 18. Utah, 1, 2, 3, 22.

HUMIDITY.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	82	+4	Missouri Valley	80	+5
Middle Atlantic	74	+3	Northern Slope	64	+7
South Atlantic	76	+2	Middle Slope	62	+2
Florida Peninsula	75	+2	Southern Slope	64	+6
East Gulf	65	-5	Southern Plateau	36	+3
West Gulf	73	-0	Middle Plateau	48	+3
Ohio Valley and Tennessee	67	-1	Northern Plateau	59	+1
Lower Lake	76	+6	North Pacific Coast	76	+2
Upper Lake	76	+4	Middle Pacific Coast	72	+0
North Dakota	57	-7	South Pacific Coast	72	+4
Upper Mississippi	65	-2			

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	6.6	+1.1	Missouri Valley	4.2	-1.2
Middle Atlantic	6.4	+1.2	Northern Slope	4.3	-0.6
South Atlantic	5.9	+0.8	Middle Slope	4.6	-0.2
Florida Peninsula	4.0	-0.5	Southern Slope	4.6	+0.1
East Gulf	4.2	-0.1	Southern Plateau	2.6	+0.4
West Gulf	4.6	+0.3	Middle Plateau	4.7	+0.6
Ohio Valley and Tennessee	5.3	+0.2	Northern Plateau	5.7	+0.1
Lower Lake	6.3	+1.0	North Pacific Coast	6.6	+0.7
Upper Lake	6.1	+0.6	Middle Pacific Coast	4.4	+0.3
North Dakota	3.1	-2.3	South Pacific Coast	4.8	+0.6
Upper Mississippi	4.7	-0.5			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex.	2	51	sw.	Mount Tamalpais, Cal.	10	50	nw.
Block Island, R. I.	19	55	e.	Do.	12	65	nw.
Denver, Colo.	2	50	s.	Do.	14	55	nw.
El Paso, Tex.	81	73	ne.	Do.	17	71	nw.
Fort Worth, Tex.	16	58	w.	Do.	18	64	nw.
Mount Tamalpais, Cal.	2	54	nw.	Do.	23	68	nw.
Do.	9	50	nw.	New York, N. Y.	3	62	nw.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 2,479 thunderstorms were received during the current month as against 3,855 in 1900 and 1,202 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 24th, 340; 10th, 221; 2d, 220.

Reports were most numerous from: Ohio, 287; Colorado, 233; North Carolina, 229.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz: April 29 to May 7.

In Canada.—Thunderstorms were reported as follows: Halifax, 12th, 13th; Yarmouth, 12th; Charlottetown, 13th; Bissett, 11th, 17th; Kingston, 18th; Toronto, 2d, 9th, 12th, 24th, 30th; White River, 2d, 31st; Port Stanley, 2d, 8th, 24th; Parry Sound, 2d; Winnipeg, 1st; Minnedosa, 1st; Qu' Appelle, 3d; Medicine Hat, 7th, 9th, 18th, 19th, 21st, 22d, 28th, 29th, 30th; Swift Current, 6th, 19th, 23d, 29th, 30th; Prince Albert, 19th; Battleford, 1st, 3d, 7th, 8th, 30th; Barkerville, 16th; Hamilton, Bermuda, 7th, 28th.

DESCRIPTION OF TABLES AND CHARTS.

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Table I gives, for about 145 Weather Bureau stations making two observations daily for and about 25 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,700 stations occupied by voluntary observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (....).

Table III gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind. The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division the average resultant direction for that division can be obtained.

Table IV gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table V gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes...	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates pr. hr. (ins.)...	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table VI gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director,

the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table VII gives the heights of rivers referred to zeros of gages.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are constructed in the same way. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. Within each circle is also given (Chart I) the highest barometric reading and (Chart II) the lowest pressure at or near the center at that time.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all, by 0.0.

Chart IV.—Sea-level pressure, temperature, and resultant surface winds. The wind directions on this Chart are the computed resultants of observations at 8 a. m. and 8 p. m., daily; the resultant duration is shown by figures attached to each arrow. The temperatures are the means of daily maxima and minima and are reduced to sea level. The pressures are the means of 8 a. m. and 8 p. m. observations, daily, and are reduced to sea level and to standard gravity. The reduction for 30 inches of the mercurial barometer, as formerly shown by the marginal figures for each degree of latitude, has already been applied.

Chart V.—Hydrographs for seven principal rivers of the United States.

Chart VI.—Surface temperatures; maximum, minimum, and mean. Lines of equal monthly mean temperature in red; lines of equal maximum temperature in black; and lines of equal minimum temperature (dotted) also in black.

Chart VII.—Percentage of sunshine. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of sunshine, and the values thus obtained have been used in preparing Chart VII.

Chart VIII.—West Indian monthly isobars, isotherms, and resultant winds.

Chart IX.—Total snowfall.